ORIGINAL ARTICLE

Comparison of sequential organ failure assessment score and cardiac surgery score systems for mortality prediction after emergency acute aortic dissection surgery

Mustafa Emre Gürcü, M.D.,[1] Şeyhmus Külahcıoğlu, M.D.,[2] Pınar Karaca Baysal, M.D.,[1] Özge Altas, M.D.,[3] Serkan Çelik, M.D.,[3] Özgür Arslan, M.D.,[3] Atakan Erkılınç, M.D.,[1] Hacer Ceren Tokgöz, M.D.,[2] Ali Karagöz, M.D.,[2] Kaan Kırali, M.D.[3]

[1]Department of Anesthesiology, Kartal Koşuyolu High Speciality Training and Research Hospital, İstanbul-*Türkiye*
[2]Department of Cardiology, Kartal Koşuyolu High Speciality Training and Research Hospital, İstanbul-*Türkiye*
[3]Department of Cardiovascular Surgery, Kartal Koşuyolu High Speciality Training and Research Hospital, İstanbul-*Türkiye*

ABSTRACT

BACKGROUND: Acute type A aortic dissection (ATAAD) is one of the most mortal cardiovascular diseases and requires urgent diagnosis and surgery. The patient's clinical findings, complications, and patient's history are closely related to mortality rates. Cardiac surgery score (CASUS) is a scoring system which is calculated by considering the special pathophysiological conditions of patients undergoing cardiac surgery and predicts post-operative results with high accuracy.

METHODS: Following the ethical approval from institutional ethics committee (ID: 2021/7/496), the data of consecutive 50 ATAAD patients who underwent emergent surgery in our hospital between January 1, 2019, and December 31, 2020, were evaluated. The Sequential Organ Failure Assessment and CASUS scores were calculated using the worst values of the daily laboratory and neurological status for both in admission to emergency department and during intensive care unit (ICU) follow-up period. The average and the total values of these scores were recorded for pre-operative, post-operative 1st day, and for the categorical data were defined as frequency and percentage. We used the Mann–Whitney U test for the independent continuous data comparisons and Pearson Chi-Square or Fisher exact test for categorical data comparison whole ICU period. Continuous data were presented as median and interquartile ranges (25–75th).

RESULTS: The study comprised 50 patients, the rate of death was 34% (n=17). In total group, there were hypertension 72% (n=36), diabetes mellitus 24% (n=12), initial hemoglobin 12.5 g/dL (10.7–14.1, 25–75th), creatinine 1.09 mg/dL (0.85–1.33, 25–75th), and 72% (n=36) of these patients were male. The CASUSmean and SOFAmean scores were higher in the death-group when compared with the group who survived (12.9 [9.5–13.8, 25–75th], 3 [2–5, 25–75th]; 8 [6.1–9.2, 25–75th], 2.6 (2–4.5, 25–75th], p<0.001, respectively]. CASUSmean was independently associated with the 1-month mortality in model 1 (HR 1.25 [1.14–1.37] (p<0.001).

CONCLUSION: According to our results increase in CASUS mean was the main predictor of 1 month mortality. When CASUS mean exceeds 8.3 the patient should be followed up more carefully for major adverse events including death.

Keywords: Acute type A aortic dissection; cardiac surgery score; mortality; sequential organ failure assessment score.

INTRODUCTION

Acute type A aortic dissection (ATAAD) is one of the most mortal cardiovascular diseases and requires urgent diagnosis and surgery. It is associated with a 58% mortality rate with only medical treatment and an average of 27% mortality in patients who undergo surgical intervention.[1] The patient's clinical findings, complications, and patient's history are

Cite this article as: Gürcü ME, Külahcıoğlu S, Karaca Baysal P, Altas Ö, Çelik S, Arslan Ö, et al. Comparison of sequential organ failure assessment score and cardiac surgery score systems for mortality prediction after emergency acute aortic dissection surgery. Ulus Travma Acil Cerrahi Derg 2022;28:1298-1304.

Address for correspondence: Mustafa Emre Gürcü, M.D.
Kartal Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Anestezi Kliniği, İstanbul, Türkiye
Tel: +90 216 - 500 15 00 E-mail: emregurcu@gmail.com

Ulus Travma Acil Cerrahi Derg 2022;28(9):1298-1304 DOI: 10.14744/tjtes.2021.27845 Submitted: 08.04.2021 Accepted: 01.06.2021
Copyright 2022 Turkish Association of Trauma and Emergency Surgery

closely related to mortality rate.[2] The presence of rupture, hypotension, shock, tamponade, pulse deficit, and acute renal failure during admission to the emergency department increases the mortality rate.[3] However, these clinical conditions are not enough for predicting morbidity and mortality rate.

To predict the mortality, morbidity, and the severity of the disease in critical patients, scoring systems are implemented. Several factors that increase the risk of in-hospital mortality and morbidity have been demonstrated: including specific clinical conditions and urgency following the administration to hospital and intensive care unit (ICU). The ideal scoring system should consist of variables that can be easily and routinely recorded, be well calibrated and highly distinctive, applicable to all patient groups and also be able to predict functional status and quality of life after being discharged from ICU.[4] At present, the most established scores are the Acute Physiology and Chronic Health Evaluation (APACHE) II, the Simplified Acute Physiology Score II, and the Sequential Organ Failure Assessment (SOFA). Although all these scoring systems can be used for cardiovascular diseases, it has been shown that patients might be under estimated with them and Cardiac Surgery Score (CASUS) has been developed to complement those deficiencies.[5]

The aim of this study is to compare the efficiency of scoring systems in terms of mortality and morbidity in patients undergoing emergent surgery for ATAAD.

MATERIALS AND METHODS

Study Design

Following the ethical approval from institutional ethics committee (ID: 2021/7/496), the data of consecutive 50 ATAAD patients who underwent emergent surgery in our hospital between January 1, 2019, and December 31, 2020, were evaluated. Patients' information in our data base was retrospectively reviewed. Patients who underwent emergent surgery for ATAAD whose clinical symptoms started in <24 h were included in the study. Patients who did not undergo surgery within 24 h after the diagnosis were excluded from the study.

Anesthetic and Surgical Procedure

Anesthetic induction with intravenous fentanyl (5–10 mcg/kg) and propofol (1–2 mg/kg) and endotracheal intubation with rocuronium (0.5 mg/kg) was performed. Anesthesia was maintained with repeated intravenous bolus of fentanyl, rocuronium and 2% sevoflurane in 60% oxygen-air mixture during the operation. Patients were heparinized (300 U/kg) and median sternotomy was performed after adequate activated clotting time (>400 s). Cardiopulmonary bypass (CPB) was established by arterial cannulation for antegrade perfusion through right axillary artery and venous cannulation through the right atrium. Patients were cooled down to 22–24° C with partial requirement of CPB (10 mL/kg flow velocity) while performing the distal aortic anastomosis. Moderate/deep hypothermic cardiac arrest during cerebral antegrade perfusion (CAP) is crucial to limit the cerebral, as well as the cardiac damage. Cerebral perfusion monitoring was performed by intraoperative measurements using near-infrared spectroscopy (NIRS). Methylprednisolone (10 mg/kg) and thiopental (15 mg/kg) were administrated during cooling to reduce cerebral metabolic requirements. The mean CPB time was 195 (148–251) min with a mean aortic cross-clamp (AoXCl) time was 89 (65.5–121) min. The patients were weaned-off CPB properly after reestablishing the circulation and transferred to ICU as sedatized and intubated with stabilized hemodynamics.

Demographic information, pre-operative laboratory, and radiological findings, mean duration of the operation, post-op-

Organ System	Descriptor	Score points				
		0	1	2	3	4
Respiratory	PaO_2/FiO_2 mmHg	extubated	>250	151–250	75–150	<75
Renal	S. creatinine (mg/dL)	<1.2	1.2–2.2	2.3–4.0	4.1–5.5	>5.5
	CVVH/dialysis	no	-	-	-	yes
Liver	S. bilirubin (mg/dl)	<1.2	1.2–3.5	3.6–7.0	7.1–14.0	>14.0
Cardiovascular	PAR = HR x CVP/MAP	<10.1	10.1–15.0	15.1–20.0	20.1–30.0	>30.0
	lactic acid (mmol/l)	<2.1	2.1–4.0	4.1–8.0	8.1–12.0	>12.0
	intraaortic balloon pump	no	-	-	-	yes
	ventricular assist device	no	-	-	-	yes
Coagulation	platelets x 10^3/μL	>120	81–120	51–80	21–50	<21
Central nervous	neurologic state	normal	-	confused	sedated	diffuse neuropathy

CVVH: continuous venovenous hemofiltration; CVP: central venous pressure; FiO_2: fraction of inspired oxygen; HR: heart rate; MAP: mean arterial blood pressure; PAR: pressure adjusted heart rate; PaO_2: partial oxygen pressure; S. bilirubin: serum bilirubin; S. creatinine: serum creatinine

CASUS SCORE

Organ System	Descriptor	Score points			
		1	2	3	4
Respiratory	PaO_2/FiO_2 mmHg	≤400	≤300	≤200, on ventilator	≤100, on ventilator
Renal	creatinine, mg/dL or urine output, mL/d	1.2–1.9	2.0–3.4	3.5–4.9 or <500	>5 or <200
Liver	bilirubin, mg/dL	1.2–1.9	2.0–5.9	6.0–11.9	≤12.0
Cardiovascular	catecholamines, μg/kg/min or MAP	MAP <70	dopamine ≤5, dobutamine (any dose)	dopamine >5, epinephrine ≤0.1, norepi ≤0.1	dopamine >15, epinephrine >0.1, norepi >0.1
Coagulation	platelets x 10^3/μL	≤150	≤100	≤50	≤20
Central nervous	Glasgow coma scale	14–13	12–10	9–6	<6

PaO_2: partial oxygen pressure; FiO_2: fraction of inspired oxygen; MAP: mean arterial blood pressure; norepi: norepinephrine

SOFA SCORE

Figure 1. CASUS score and SOFA score.

erative neurological status and laboratory/screening results during ICU period were recorded for all the patients. The SOFA and CASUS scores (Fig. 1) were calculated using the worst values of the daily laboratory and neurological status for both in admission to emergency department and during ICU follow-up period. The average and the total values of these scores were recorded for pre-operative, post-operative 1st day, and for the whole ICU period. The clinical results were defined as post-operative morbidity and mortality. The death of the patient within the first 24 h of the operation was defined as perioperative mortality and death in the 1st month was defined as early mortality.

Statistical Analysis

Continuous data were presented as median and interquartile ranges (25–75th), and categorical data were defined as frequency and percentage. Mann-Whitney U test was used for the independent continuous data comparisons and Pearson Chi-square or Fisher exact test for categorical data comparison.

Outcome Variable

All-cause death in the 1-month follow-up.

Candidate Predictors

We included Age, Creatinin, as two-candidate predictors for all models. The association of $CASUS_{initial}$ with two candidate predictors was evaluated using penalized Cox regression (Model-1). In model 2, we used "$CASUS_{mean}$", instead of $CASUS_{initial}$, but other variables were the same. In model 3, we used $SOFA_{initial}$, instead of $CASUS_{initial}$, but other variables were the same as model-1. In model 4, we used $SOFA_{mean}$, instead of $CASUS_{initial}$, but other variables were the same as model-1.

Statistical Modeling

To detect all-cause mortality predictors, multivariable penalized Cox proportional hazard regression was used to minimize over-fitting and to decrease bias. Effects of individual predictors were reported using Hazard-ratio and 95% confidence interval. Candidate predictors of multivariable regression model were selected according to the literature, consensus opinion by an expert group of physicians, and our focused variables CASUS and SOFA. In addition, visual depiction of mortality between CASUS low and CASUS high made by Kaplan-Meier curve, log-rank test was used for group comparison.

Model Performance Measurement

Performance of the models measured by Likelihood ratio X_2 (higher value is better), Adjusted R_2 (higher value is better), and the Harrel C-index (c-statistics measures the discriminative ability of the model, and values closer to 1.0 are better). The models were compared according to the assessment of fit (likelihood ratio Chi-square), adjusted R_2 and discriminative index the C-index values were used to compare model 1, 2, 3, and model 4.

For all-statistical analyses, two tailed P-value of <0.05 was considered as statistically significant. Statistical analyses were performed using R version 4.01 software (Vienna, Austria) with "rms" "survival," "ggplot$_2$," "maxstat," and "coxphf" packages.

RESULTS

The study was consisted of 50 patients, the rate of death was 34% (n=17). Among these patients the predictor variables are as follows; hypertension (HT) 72% (n=36), diabetes mellitus 24% (n=12), initial hemoglobin 12.5 g/dL (10.7–14.1, 25–75th), and creatinine 1.09 mg/dL (0.85–1.33, 25–75th). About 72% (n=36) of these patients were male. Need of Frozen Fresh Plasma 2U (1–3, 25–75th), ICU stay 3 day (2–5.75, 25–75th). The mean CPB time was 195 (148–251) min with a mean aortic cross-clamp *(AoXCl)* time was 89 (65.5–121) min. There was no statistical difference between survived and death group in terms of age, gender, DM, HT, and aortic regurgitation. However, usage of Erythrocyte Suspension, AoX-Cl duration, CPB duration, and CAP duration was higher in death group when compared with the survival group. Rest of variables is shown in Table 1.

There was no statistically significant difference between death and survival group in terms of NIRS-L1, -L2 and -R1. However, the $CASUS_{mean}$, $SOFA_{mean}$ score were higher in the death-group when compared with the group who survived (12.9 [9.5–13.8, 25–75th], 3 [2–5, 25–75th]; 8 [6.1–9.2, 25–75th], 2.6 [2–4.5, 25–75th) <0.001, <0.001, respectively). Rest of variables is shown in Table 2.

The relationship $CASUS_{mean}$ was examined in model-2. $CASUS_{mean}$ was independently associated with the 1-month mortality in model 1 (HR 1.25 [1.14–1.37] [p<0.001]), (Table 3, model-2). In addition, the $SOFA_{mean}$ was examined in model 4. $SOFA_{mean}$ was independently associated with death (HR1.33 [1.17–1.51] [p<0.001]) (Table 3).

The performance of base model-1 model-2, model-3, and model-4 is demonstrated in Table 3. The likelihood x^2, C-index, and adjusted R_2 values for model-2 were higher than model-1, model-3, and model-4 (higher value is better) (Table 3).

The maximally selected rank statistic, which provide us, the classification of $CASUS_{mean}$ into two groups for predicting mortality (Fig. 2). Kaplan-Meier curve showed higher mortality in $CASUS_{mean}$ high score group when compared with low score group, log-rank test p<0.001 (Table 4, Fig. 3).

The causes of perioperative mortality (n=11, 65%) in our patients were, bleeding (n=4, 36%), low cardiac output (n=4,

Table 1. Baseline clinical labaratory, operation and imaging variables comparison between death and surviver group

Variables	All (n=50)	Survive (n=33)	Death (n=17)	p
Age (year)	55 (41.5–67.5)	54 (47–59)	59 (54–72.5)	0.06
BSA (m^2)	1.94 (1.81–2.02)	1.94 (1.85–2.1)	1.94 (1.79–2)	0.37
Gender (male), n (%)	38 (76%)	25 (75.8%)	13 (76.5%)	0.95
HT, n (%)	36 (72%)	24 (72.7%)	12 (70.6%)	0.87
DM, n (%)	12 (24%)	7 (21.2%)	5 (29.4%)	0.52
EF (%)	60 (55–65)	60 (55–65)	60 (52.5–62.5)	0.29
AR, n (%)				
0	1 (2)	1 (3)	–	
1	12 (24)	9 (27.3)	3 (17.6)	0.69
2	23 (46)	15 (45.5)	8 (47.1)	
3	14 (28)	8 (24.2)	6 (35.3)	
Creatinine (mg/dL)	1.09 (0.85–1.33)	1.03 (0.84–1.33)	1.25 (1.03–1.33)	0.04
Bilirubin (mg/dL)	0.94 (0.27–2.04)	0.91 (0.36–1.02	0.96 (0.27–2.04)	0.187
Hemoglobine (g/dL)	12.5 (10.7–14.1)	12.6 (10.1–14.2)	12.1 (10.8–14.1)	0.99
Hematocrit (%)	38.7 (32.6–42.2)	39.7 (30.6–43.3)	38.1 (32.8–41.5)	0.83
Erythrocyte Suspension (unite)	2.5 (1–4.75)	2 (1–3)	5 (3–7)	0.01
Frozen Fresh plasma (unite)	2 (1–3)	2 (1–3)	2 (1.5–3.5)	0.99
Operation duration (hour)	6 (5.1–7)	5.5 (5–6)	8 (7–9)	<0.001
AoXCl duration (minutes)	89 (65.5–121)	76 (62–115)	104 (83–143)	0.04
CAP duration (minutes)	37 (25.8–52.3)	32 (24–39)	67 (40–107)	0.045
CPB duration (minutes)	195 (148–251)	156 (123–214)	300 (208–389)	0.002
Extubation duration (hour)	20 (8.5–38)	13 (8–34)	24 (19–34)	0.11
ICU stay (day)	3 (2–5.75)	4 (3–5)	2 (1–12)	0.96
Hospital stay (day)	8 (6–11.8)	9 (7–11)	2 (1–12)	0.02

Continuous varibales presented median (25^{th}–75^{th}), cathegorical variables presented number and percent. BSA: Body surface area; HT: Hypertension; DM: Diabetes mellitus; EF: Left ventricular ejection fraction; AR: Aortic regurgation; AoXCl: Aortic cros clemp; CAP: Cerebral antegrade perfusion; CPB: Cardiopulmonary bypass; ICU: Intensive care unit.

36%), and aortic ruptur/tamponade (n=3, 28%), and the causes of early mortality (n=6, 35%) were, neurological events (cerebral edema/ischemic stroke; (n=4, 68%), bleeding (n=1, 16%), and sepsis (n=1, 16%).

Table 2. Baseline ICU disease severity scores comparison between death and surviver group

	All (n=50)	Surviver (n=33)	Death (n=17)	p
NIRS-L_1	62 (52–67)	62 (54–67)	55 (49–69)	0.31
NIRS-L_2	52 (45–57)	52 (47–58)	51 (44–54.5)	0.23
NIRS-R_1	59 (52–64.8)	61 (57–67)	58 (51.5–62.5)	0.18
NIRS-R_2	51 (47–58)	54 (48–62)	48 (44–50.5)	0.01
$CASUS_{initial}$	3.5 (2–7)	3 (2–5)	7 (5–10.5)	0.002
$CASUS_{mean}$	4.5 (2.5–9.8)	3 (2–5)	12 (9.5–13.8)	<0.001
$CASUS_{total}$	12.5 (7–29.8)	11 (5–25)	23 (10.5–55.5)	0.13
$SOFA_{initial}$	2 (1–5)	1 (1–2)	5 (4–7)	<0.001
$SOFA_{mean}$	4.35 (2.3–6.8)	2.6 (2–4.5)	8 (6.1–9.2)	<0.001

Continuous variables presented median (25^{th}–75^{th}) and compared with Mann-Whitney U test. ICU: Intensive care unit; NIRS: Near infrared spectroscopy; CASUS: Cardiac surgery score; SOFA: Sequential organ failure assessment.

Table 3. Penalized Cox Regression Analyses For One Month Mortality And Model Performance Measurement; Model-1,-2,-3 and -4

	Model-1	p	Model-2	p	Model-3	p	Model-4	p
Age (year)	1.04 (1.01–1.09)	0.04	1.03 (0.99–1.08)	0.13	1.04 (0.99–1.08)	0.06	1.03 (0.99–1.07)	0.16
Creatinin (mg/dL)	0.84 (0.55–1.17)	0.55	0.97 (0.64–1.28)	0.84	1.01 (0.67–1.34)	0.96	0.94 (0.62–1.26)	0.71
$CASUS_{int}$	1.28 (1.13–1.45)	<0.001	–	–	–	–	–	–
$CASUS_{mean}$	–	–	1.25 (1.14–1.37)	<0.001	–	–	–	–
$SOFA_{int}$	–	–	–	–	1.34 (1.16–1.56)	<0.001	–	–
$SOFA_{mean}$							1.33 (1.17–1.51)	<0.001
Model performance measurements								
Likelihood Ratiochi-square	23.01	–	29.56	–	21.47	–	24.41	–
C-index	0.802	–	0.850	–	0.802	–	0.836	–
Adjusted R^2	0.269	–	0.421	–	0.306	–	0.349	–

CASUS: Cardiac Surgery Score; SOFA: Sequential Organ Failure Assessment.

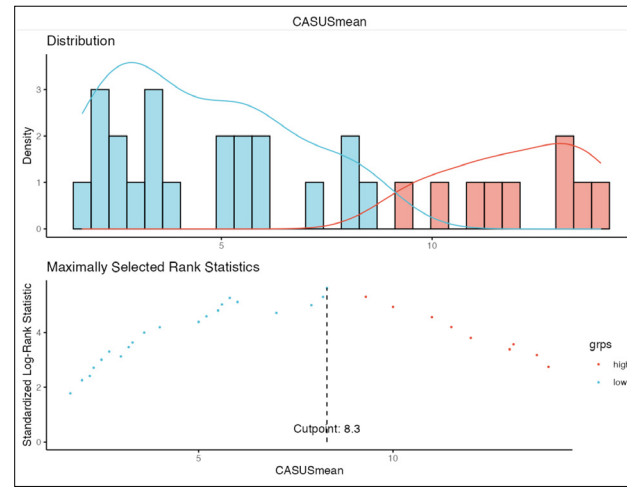

Figure 2. Maximally selected rank statistics plot, for the evaluation of cut points of $CASUS_{mean}$.

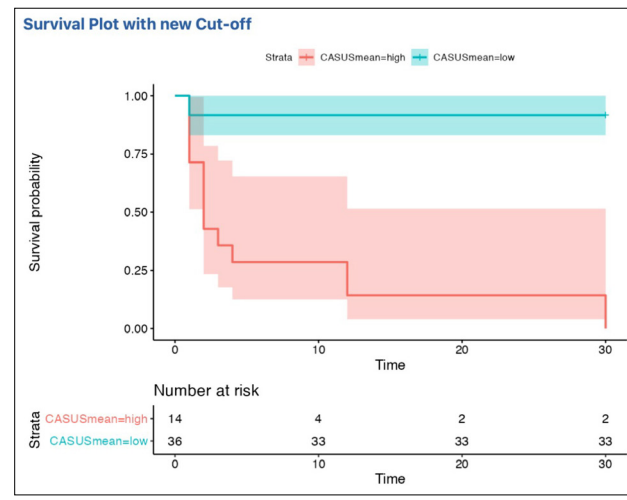

Figure 3. Kaplan-Meier curve comparison between $CASUS_{mean}$ score high and low group.

DISCUSSION

In this study, we showed that the $CASUS_{mean}$ score could be used along with other known parameters to predict 1 month mortality in patients with ATAAD. We also observed that $CASUS_{mean}$ is a better predictor than $CASUS_{initial}$, $SOFA_{initial}$, and $SOFA_{mean}$.

ATAAD is associated with high mortality and important prognostic factors related with mortality include advanced age, hemodynamic instability, presence of hematoma, and/or rupture,[6] cerebrovascular damage, organ malperfusion, acute kidney injury, pre-operative tamponade, and shock. In addition, operation and CPB time are the significant factors that affect mortality.[7] Being apart from all these prognostic factors, scoring systems utilized in ICUs to help to predict morbidity and mortality; but most of postoperative score models have limited applicability in cardiac surgery.[8] Given the fact that SOFA score was a morbidity risk score for septic patients initially, it is now used for the prediction of mortal-

Table 4. Comparison between $CASUS_{mean}$-high and -low group

	No of patient	No of event	1-month Survival probability	Confidence interval
$CASUS_{mean}$=high	14	12	14.3%	4%–51%
$CASUS_{mean}$=low	36	3	91.7%	83%–100%

CASUS: Cardiac surgery score.

ity and morbidity in ICU for patients who underwent any surgical procedure. It is a reliable score which has also been recommended in recent studies.[9–11] The pathophysiological effects of heart-lung machine, sedative drugs for post-operative stabilization, and long duration of mechanical ventilator limit the reliability of these scoring systems such as SOFA score.[12] CASUS is a scoring system which is calculated by considering the special pathophysiological conditions of patients undergoing cardiac surgery and predicts post-operative results with high accuracy in this patient group.[5]

Although all scoring systems highly correlate with clinical outcomes in patients who undergo cardiovascular surgery, CASUS has been shown to be more reliable and more beneficial in risk stratification in this patient population. Badreldin et al. reported in their study that they predicted mortality after cardiovascular surgery with a high percentage of all CASUS derivatives and especially the $CASUS_{mean}$ value.[8] In another study they compared SOFA and CASUS scores, they showed that the CASUS score was more accurate in predicting survival and mortality than SOFA for all days in ICU.[13] Exarchopoulos et al. evaluated the post-operative 30-day results of patients who underwent cardiac surgery and stated that the CASUS score was better than the EuroSCORE II score for predicting mortality in terms of both discrimination and calibration, and the SOFA score for morbidity prediction.[14] In another study, it was shown that CASUS was the best predictor of mortality, followed by ICNARC, Logistic EuroSCORE and APACHE II, additionally ICNARC score was the most accurate predictor of renal and pulmonary complications, followed by CASUS.[15] When the $CASUS_{mean}$ and $SOFA_{mean}$ values of the patients who died and survived in our study were compared, we found that these scores were higher in the patients who died. We found that the $CASUS_{mean}$ score is a better predictor of mortality than the $SOFA_{mean}$ score ($CASUS_{mean}$ c-index:0.850, $SOFA_{mean}$ c-index:0.836). In addition, according to the results of our study, the endpoint value of $CASUS_{mean}$ was 8.3, and the 1-month estimated survival probability of patients within the high-score group was 14.3%, while in low-score group it was 91.7%.

In a larger registry, in-hospital mortality in patients with acute aortic dissection is 27.4%. The most common causes of death in Type A dissections are aortic rupture or cardiac tamponade (41.6%) and visceral ischemia (38.5%).[1] Cardiac events are the most common cause of postoperative early mortality in patients with ATAAD, followed by neurological and vascular complications.[16] Furthermore, renal, and visceral ischemia are associated with high operative mortality.[17] In this study, we found the mortality rate as 34% (n=17) in ATAAD patients who underwent emergent surgery. The number of the patients who died perioperative was 11 and the most common causes of death were bleeding and/or low cardiac output; however, the most observed cause of early mortality was neurological events.

Study Limitations

Our study had several limitations. First, this was a retrospective study implemented in a single center. Second, because of the nature of regression analyses, unmeasured variables may exist. Although our center is a tertiary cardiac center; we still lack enough population sample for definitive conclusion, further studies are needed to determine the importance of $CASUS_{mean}$.

Conclusion

According to our results, $CASUS_{mean}$ score was the better predictor of 1 month mortality compared other scoring system. When $CASUS_{mean}$ exceeds 8.3 the patient should be followed up more carefully for major adverse events including death.

Ethics Committee Approval: This study was approved by the Kartal Koşuyolu Ytksek İhtisas Training and Research Hospital Clinical Research Ethics Committee (Date: 13.07.2021, Decision No: 2021/7/496).

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: M.E.G., P.B., Ş.K.; Design: M.E.G., P.K.B., K.K.; Supervision: M.E.B., K.K.; Resource: S.Ç., Ö.A., A.E.; Materials: S.Ç., Ö.A., Ö.A.I., K.K.; Data: M.E.B., K.K., A.K.; Analysis: A.K., H.C.T.; Literature search: M.E.B.; Writing: M.E.B., A.E.; Critical revision: K.K.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, et al. The ınternational registry of acute aorticdissection (IRAD): New insights into an old disease. JAMA 2000;283:897–903.
2. Tsai TT, Evangelista A, Nienaber CA, Trimarchi S, Sechtem U, Fattori R, et al. Long-term survival in patients presenting with Type A acute

aortic dissection: İnsights from the ınternational registry of acute aortic dissection (IRAD). Circulation 2006;114:I350–6. [CrossRef]
3. Mehta RH, Suzuki T, Hagan PG, Bossone E, Gilon D, et al. Predicting death in patients with acute Type A aortic dissection. Circulation 2002;105:200–6. [CrossRef]
4. Bouch DC, Thompson JP. Severity scoring systems in the critically ill. Contin Educ Anaesth Crit Care Pain 2008;8:181–5. [CrossRef]
5. Hekmat K, Kroener A, Stuetzer H, Schwinger RH, Kampe S, Bennink GB, et al. Daily assessment of organ dysfunction and survival in intensive care unit cardiac surgical patients. Ann Thorac Surg 2005;79:1555–62.
6. Ehrlich MP, Ergin MA, McCullough JN, Lansman SL, Galla JD, Bodian CA, et al. Results of immediate surgical treatment of all acute Type A dissections. Circulation 2000;102:III248–52. [CrossRef]
7. Gudbjartsson T, Ahlsson A, Geirsson A, Gunn J, Hjortdal V, Jeppsson A, et al. Acute Type A aortic dissection a review. Scand Cardiovasc J 2020;54:1–13. [CrossRef]
8. Badreldin AM, Kroener A, Heldwein MB, Doerr F, Vogt H, Ismail MM, et al. Prognostic value of daily cardiac surgery score (CASUS) and its derivatives in cardiac surgery patients. Thorac Cardiovasc Surg 2010;58:392–7. [CrossRef]
9. Vincent JL, Moreno R, Takala J, Willatts S, De Mendonça A, Bruining H, et al. The SOFA (Sepsis-related organ failure assessment) score to describe organ dysfunction/failure. On behalf of the working group on sepsis-related problems of the European society of ıntensive care medicine. Intensive Care Med 1996;22:707–10. [CrossRef]
10. Vincent JL, Ferreira F, Moreno R. Scoring systems for assessing organ dysfunction and survival. Crit Care Clin 2000;16:353–66. [CrossRef]
11. Ceriani R, Mazzoni M, Bortone F, Gandini S, Solinas C, Susini G, et al. Application of the sequential organ failure assessment score to cardiac surgical patients. Chest 2003;123:1229–39. [CrossRef]
12. Ryan TA, Rady MY, Bashour CA, Leventhal M, Lytle B, Starr NJ. Predictors of outcome in cardiac surgical patients with prolonged intensive care stay. Chest 1997;112:1035–42. [CrossRef]
13. Badreldin AM, Doerr F, Ismail MM, Heldwein MB, Lehmann T, Bayer O, et al. Comparison between sequential organ failure assessment score (SOFA) and cardiac surgery score (CASUS) for mortality prediction after cardiac surgery. Thorac Cardiovasc Surg 2012;60:35–42. [CrossRef]
14. Exarchopoulos T, Charitidou E, Dedeilias P, Charitos C, Routsi C. Scoring systems for outcome prediction in a cardiac surgical ıntensive care unit: A comparative study. Am J Crit Care 2015;24:327–34. [CrossRef]
15. Raut S, Hussain A, Ariyaratnam P, Ananthasayanam A, Vijayan A, Chaudhry M, et al. Validation of cardiac surgery score (CASUS) in postoperative cardiac patients. Semin Cardiothorac Vasc Anesth 2020;24:304–12. [CrossRef]
16. Cabasa A, Pochettino A. Surgical management and outcomes of Type A dissection-the Mayo clinic experience Ann Cardiothorac Surg 2016;5:296–309. [CrossRef]
17. Miller DC, Mitchell RS, Oyer PE, Stinson EB, Jamieson SW, Shumway NE. Independent determinants of operative mortality for patients with aortic dissections Circulation 1984;70:I153–64.

ORİJİNAL ÇALIŞMA - *ÖZ*

Acil akut aort diseksiyonu cerrahisi sonrası mortalite tahmininde sıralı organ yetmezliği değerlendirme skoru (SOFA) ve kardiyak cerrahi skor (CASUS) sistemlerinin karşılaştırılması

Dr. Mustafa Emre Gürcü,[1] Dr. Şeyhmus Külahcıoğlu,[2] Dr. Pınar Karaca Baysal,[1] Dr. Özge Altas,[3] Dr. Serkan Çelik,[3] Dr. Özgür Arslan,[3] Dr. Atakan Erkılınç,[1] Dr. Hacer Ceren Tokgöz,[2] Dr. Ali Karagöz,[2] Dr. Kaan Kırali[3]

[1]Kartal Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Anestezi Kliniği, İstanbul
[2]Kartal Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Kardiyoloji Kliniği, İstanbul
[3]Kartal Koşuyolu Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Kardiyovasküler Cerrahi Kliniği, İstanbul

AMAÇ: Akut tip A aort diseksiyonu (ATAAD) en ölümcül kardiyovasküler hastalıklardan biridir ve acil tanı ve ameliyat gerektirir. Hastanın klinik bulguları, komplikasyonları ve hastalığın geçmişi ölüm oranları ile yakından ilişkilidir. CASUS, kalp cerrahisi geçiren hastaların özel patofizyolojik durumları dikkate alınarak hesaplanan ve ameliyat sonrası sonuçları yüksek doğrulukla öngören bir skorlama sistemidir.

GEREÇ VE YÖNTEM: Kurumsal etik kurul (ID: 2021/7/496) onayı alındıktan sonra 1 Ocak 2019–31 Aralık 2020 tarihleri arasında hastanemizde acil cerrahi uygulanan 50 ATAAD hastasının verileri değerlendirildi. SOFA ve CASUS skorları hem acil servise başvuru hem de YBÜ takibi süresince günlük laboratuvar ve nörolojik durumun en kötü değerleri kullanılarak hesaplandı. Bu skorların ortalama ve toplam değerleri ameliyat öncesi, ameliyat sonrası ilk gün için kaydedildi ve kategorik veriler frekans ve yüzde olarak tanımlandı. Bağımsız sürekli veri karşılaştırmaları için Mann-Whitney U testini ve kategorik veri karşılaştırması için Pearson ki-kare veya Fisher kesin testini kullandık. Sürekli veriler medyan ve çeyrekler arası aralıklar (25–75) olarak sunuldu.

BULGULAR: Çalışma 50 hastadan oluşuyordu, ölüm oranı %34 (n=17) idi. Toplam grupta hipertansiyon (HT) %72 (n=36), diabetes mellitus %24 (n=12), başlangıç hemoglobin 12.5 g/dL (10.7–14.1, 25.–75.), kreatinin 1.09 mg/dL (0.85–1.33, 25.–75), bu hastaların %72'si (n=36) erkekti. $CASUS_{ortalama}$, $SOFA_{ortalama}$ skoru hayatta kalan hastalara göre ölen hasta grubunda daha yüksekti (12.9 (9.5–13.8, 25.–75.), 3 (2–5, 25.–75.); 8 (6.1–9.2, 25.–75.), 2.6 (2–4.5, 25.–75.), p<0.001 sırasıyla). $CASUS_{ortalama}$, model 1'de bir aylık mortalite ile bağımsız olarak ilişkili bulundu (HR 1.25 (1.14–1.37) (p<0.001).

TARTIŞMA: Sonuç olarak, $CASUS_{ortalama}$'daki artış, bir aylık mortalitenin temel prediktörüdür. $CASUS_{ortalama}$ değeri 8.3'ün üzerinde, hastalar ölüm dahil önemli istenmeyen olaylar açısından daha dikkatli izlenmelidir.

Anahtar sözcükler: Akut tip A aort diseksiyonu; Kalp Cerrahisi Skoru; mortalite; Sıralı Organ Yetmezliği Değerlendirme Skoru.

Ulus Travma Acil Cerrahi Derg 2022;28(9):1298-1304 doi: 10.14744/tjtes.2021.27845